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Interactive comment on "Central Arctic Ocean paleoceanography from ∼50 ka to present, on the basis of ostracode faunal assemblages from SWERUS 2014 expedition" *by* Laura Gemery et al.

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In the context of global warming and recent Arctic sea ice waning, it is important to understand the natural forcing of past sea ice changes. Here, Gemery and co-authors present a low resolution reconstruction of Central Arctic sea ice changes over the past 50,000 years using ostracode faunal assemblages in two twin cores retrieved in 2014. Although such records are highly necessary, the manuscript suffers from several limitations and flaws that prevent acceptation in its present form. First, the manuscript does not go further than the previous study published by the same group (Cronin et al., 2010) in which conclusions were exactly the same. Central Arctic sea ice was reconstructed in several cores from the Lomonosov Ridge, over the same time period. It

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Discussion paper

was evidenced that "Results suggest intermittently high levels of perennial sea ice in the central Arctic Ocean during Marine Isotope Stage (MIS) 3 (25-45 ka), minimal sea ice during the last deglacial (16-11 ka) and early Holocene thermal maximum (11-5 ka) and increasing sea ice during the mid-to-late Holocene (5-0 ka)". Similar interpretations are here presented by Gemery and co-atuhors. The only addition to Cronin et al. (2010) is that "sea-ice cover during the last glacial maximum may have been less extensive at the southern Lomonosov Ridge at our core site (∼85.15°N, 152°E) than farther north and towards Greenland", which is pretty weak.

Second, the manuscript is only descriptive and does not present any forcing mechanisms to explain the observed changes in sea ice cover over the past 50,000 years. Why the MIS 3 did not experience perennial sea ice cover when temperatures where globally lower than during the Late Holocene? What is the link between intermittent perennial and seasonally ice-free conditions during MIS3 and HE/DO? What is the impact of lower sea-level during MIS3 on ocean circulation (less to no North Pacific waters), on sea ice formation (mainly on marginal seas if I am right) and sea ice transport off the Arctic Ocean? The new data should be presented and explained in the context of large scale ocean and atmosphere changes over the past 50,000 years. There are plenty of publications from the GIN Seas and Fram Strait to document NADW inflow (marked here by Krithe spp. and Cytheropteron spp.) and AW outflow (marked here by Polycope spp. and P. caudata). There is also a wealth of publications from continental peri-Arctic to document atmospheric patterns and their impact on central Arctic sea ice. As such, the very attractive title is misleading.

Third, results are discussed in "climatic phases" that are not congruent with the ostracode faunal changes. It is more sensible to discuss changes in the four "ostracode zones". I however do not fully agree on the four zones. Based on faunal changes more periods can be discussed: The K zone, a first increase in A. arcticum between 42-35 kyrs BPP, a P. caudata peak between 35-27 kyrs BP, a second increase of A. arcticum between 25-20 kyrs BP, a second P. caudata peak between 20-12 kyrs BP, the C zone and the A zone. There is no information on why there are so much difference in ostracode abundances and species numbers between the twin cores. Line 266-271: The shift between Polycope spp. and the Krithe-Cytheropteron group is at 12 kyrs BP not 14.5 kyrs BP. And the Krithe gp is less than 10%. Is this small increase significant? Over the deglaciation I see the following sequence: P. caudata (20-12 kyrs BP); Cytheropteron (12-9 kyrs BP); Krithe (10-7 kyrs BP). This is not really discussed. Line 280: Krithe spp. are less than 10%. This is not what I call abundant.

Fourth, the "Results" part present description of results mingled with some environmental interpretations. And the "Discussion" part does not present any environmental interpretations nor forcing mechanisms. The structure should be modified accordingly. Lines 307-325: Useless in the paper. Authors should stick to paleoceanographic reconstructions and interpretations.

Fifth, the paper oscillates between presenting new sea ice reconstructions (but no explanation of such changes) and validation of R. mirabilis to infer past sea ice changes. I would say that these are two different topics mand should be presented in two different papers. Additionally, records of R. mirabilis should be described in the "Results" part. They here appear out of the blue at the very end of paper. Lines 328-330: Ostracode species mentioned here are not presented in the results. There is no way to compare and assess what is written. Although it is difficult to assess here because the records are presented in different plots, it seems to me that R. mirabilis record in the twin cores are similar to the Krithe spp. record with peaks centered at 42-44 kyrs BP and 10-5 ka BP. This contradicts lines 328-333 where authors state that R. mirabilis modern distribution mimics B aculeata's one. This should be expanded. Why these two species share a similar modern distribution (linked to perennial sea ice) while presenting different down-core records whereby B. aculeata is still linked to perennial sea ice while R. mirabilis goes together with species tracking less sea ice and NADW influx into central Arctic?

Sixth, the "Chronology" part is not totally clear to me. Data used to estimate the mentioned 3cm offset between the MC and GC cores are not presented. The tuning below 31.5 cm is not presented. It seems that there is only one point with E. huxleyi to infer the MIS5. I strongly doubt that the mean reservoir age was constant through time. It should be acknowledges even though this may not have a big impact on the results/interpretations here due to low temporal resolution.

Seventh, the “Introduction” is very weak. The scientific issue is not very well presented (only in first and last paragraph). There is not state-of-the art. I suggest to much better highlight the difference to Cronin et al. (2010).

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